



Impact Area Groundwater Study Program

FINAL

Former A Range Interim Environmental Monitoring Report Sampling Year 2012

**Camp Edwards
Massachusetts Military Reservation
Cape Cod, Massachusetts**

November 2012

Prepared for:

Army National Guard
Impact Area Groundwater Study Program
Camp Edwards, Massachusetts

Prepared by:

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New England District
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DISCLAIMER

This document has been prepared pursuant to government administrative orders (U.S. EPA Region I SDWA Docket No. I-97-1019 and 1-2000-0014) and is subject to approval by the U. S. Environmental Protection Agency. The opinions, findings, and conclusions expressed are those of the authors and not necessarily those of the Environmental Protection Agency.

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1.0 INTRODUCTION

The Former A Range (also known as the Former Gravity Anti-Tank Range) is an inactive anti-tank artillery and rocket practice range. It is located west of the Impact Area in the southern portion of Training Area B-9 (Figure 1-1). The range was originally constructed in 1941 and functioned as an anti-tank artillery and rocket site until the 1960s. A prominent feature of the range was a short downhill rail line used for the gravity-propelled movement of cars to provide moving targets. Records indicate that ordnance used during this period included 37 millimeter (mm) armor piercing and high explosive (HE) rounds, 40mm armor piercing and HE projectiles, 75mm HE and shot projectiles, 90mm artillery projectiles, and 3.5-inch practice rockets (bazooka). Between the early 1960s and mid-1970s, the range was converted to a machine gun practice area. It is not clear how the range was configured and whether firing was conducted on moving targets in a manner similar to earlier artillery and rocket training, but records do indicate that .50 caliber ball and tracer rounds were used at that time. No documentation has been identified that describes activities at the range after the mid-1970s.

Three well clusters (MW-149, MW-206, and MW-249) were installed, in part, to evaluate groundwater conditions downgradient of the Former A Range (Figure 1-2). Boring locations and screen intervals were carefully selected based on field reconnaissance inspections, model particle tracks, and groundwater profiling results in consultation with the US Environmental Protection Agency (USEPA) and the Massachusetts Department of Environmental Protection (MassDEP). Monitoring wells MW-149S, MW-206S, and MW-249M3 were constructed in 2001, 2002, and 2003, respectively, to intercept groundwater originating from beneath the target area of the range. Several rounds of groundwater sampling were performed in the ensuing years and low level range-related groundwater contamination has been found, including the compounds 2,4,6-trinitrotoluene (TNT), 2-amino-4,6-dinitrotoluene (2A-DNT), and 4-amino-2,6-dinitrotoluene (4A-DNT). A more comprehensive description of early investigation activities and past monitoring results is provided in the *Final Former A Range Investigation Report (IAGWSP, 2012)*.

Wells MW-149S, MW-206S, and MW-249M3 continue to be sampled under an ongoing IAGWSP interim groundwater monitoring program designed specifically for the range and laboratory results have been documented in a series of summary reports. An additional monitoring well site, MW-536, was established downgradient of Former A Range in late 2009 to, in part, further assess whether any explosives-related contaminants were migrating to groundwater from the target area of the range. The most recently submitted report, *Final Former A Range Environmental Monitoring Report Sampling Year August 2010 through May 2011* (USACE, 2012), covers groundwater results for the designated reporting period. Sampling results for the current reporting year (2012) from MW-149S, MW-206S, MW-249M3, and MW-536S are presented herein. In a September 2012 Final Decision Document, USEPA determined that limited

action with long-term groundwater monitoring, land use controls to protect monitoring wells, and five year reviews are appropriate for the Former A Range.

Future groundwater monitoring results will continue to be reported in subsequent Interim Environmental Monitoring Reports until a Final Environmental Monitoring Plan is established for the site.

2.0 SAMPLING PROGRAM

In 2005, groundwater monitoring at Former A Range was performed in accordance with the installation-wide *Draft Long-Term Groundwater Monitoring Plan 2005* (AMEC, 2005). Later in 2005, a monitoring well network specific to Former A Range was proposed in the *Draft Former A Range Interim Groundwater Monitoring Plan Project Note* (IAGWSP, 2005). Under this plan and subsequent revisions, samples have been collected since 2006 for analysis of explosives and perchlorate. The current sampling schedule is shown in Table 2-1.

For this reporting period, groundwater sampling was conducted June 12, 2012 and June 20, 2012. Samples collected in 2012 were analyzed for explosives compounds by EPA Method 8330 and/or perchlorate by EPA Method 6850.

3.0 MONITORING RESULTS

A complete summary of the analytical results for groundwater samples collected during the 2012 reporting period are presented in Table 3-1. Explosives and perchlorate detections are summarized on Figure 3-1. Notable observations and trends are summarized in the following sections.

3.1 Explosives

Explosives compounds were detected in well MW-249M3 only. In June 2012, TNT, 2A-DNT, 4A-DNT and 1,3,5-Trinitrobenzene (1,3,5-TNB) were reported at concentrations of 0.23 µg/L, 0.15 J µg/L, 0.15 J µg/L and 0.13 J µg/L, respectively. These concentrations are consistent with past sampling results for well MW-249M3, each falling within the historic range of values just above or below the 0.20 µg/L method reporting limit (Figure 3-2). This was the second detection of 1,3,5-Trinitrobenzene which was also detected at 0.33 J µg/L in June 2005. The detected concentrations of explosives are well below levels of concern.

Explosives compounds have not been detected in well MW-149S during 21 consecutive sampling rounds beginning in 2001. Similarly, beginning in 2002, no explosives have been observed in 18 consecutive sampling rounds performed at well MW-206S. No explosives compounds were detected in MW-536S for the fourth consecutive sampling round since the well was installed in late 2009.

3.2 Perchlorate

During the 2012 reporting period, perchlorate was detected in both sampled wells, MW-249M3 and MW-536S, at a reported concentration of 0.032 J and 0.13 J $\mu\text{g/L}$, respectively. Prior to the change to EPA analytical Method 6850 in 2009, perchlorate had only been detected once at the Former A Range, and only in well MW-249M3. The only detection in eleven sampling events at MW-249M3 was the site-wide historical maximum concentration (0.44 J $\mu\text{g/L}$) observed in the field duplicate sample (but not in the primary sample) in November 2004. Since 2009, trace detections have been observed in seven of eight samples collected from MW-249M3 and MW-536S suggesting that its presence in recent samples is more likely the result of the increased sensitivity of EPA Method 6850 than a change in groundwater quality.

There is no federally-promulgated Maximum Contaminant Level (MCL) for perchlorate in drinking water. The EPA lifetime health advisory for perchlorate in drinking water is 15 $\mu\text{g/L}$. The Massachusetts MCL for perchlorate is 2 $\mu\text{g/L}$.

4.0 RECOMMENDATIONS

In consideration of consistent results obtained in the network wells sampled in 2012 and previous years, the sampling frequency will be decreased from annual to biennial (every two years for calendar years 2014 and 2016). Groundwater monitoring will be conducted at monitoring wells MW-149S and MW-206S for explosives and MW-249M3 and MW-536S for explosives and perchlorate. The data will be assessed as part of a five-year review to be conducted in 2017 and the need for additional monitoring will be determined at that time. This change is consistent with the Final Decision Document (USEPA, 2012). The approved change to the monitoring well network is described in the Project Note included as Appendix A of this document.

Changes to the Former A Range interim monitoring well network (i.e., the addition or removal of wells) and adjustments to sampling frequencies and laboratory analyses will continue to be considered annually based on observed contaminant concentrations and trends.

5.0 REFERENCES

AMEC, 2005. *Draft Long-Term Groundwater Monitoring Plan 2005*. Impact Area Groundwater Study Program, Massachusetts Military Reservation, Cape Cod, Massachusetts. Prepared by AMEC Earth and Environmental, Westford, Massachusetts. April 8, 2005. (EDMS Document ID 8233)

AMEC, 2004. *Final Former A Range Additional Delineation Work Plan*. Impact Area Groundwater Study Program, Massachusetts Military Reservation, Cape Cod, Massachusetts. Prepared by AMEC Earth and Environmental, Westford, Massachusetts. September 17, 2004. (EDMS Document ID 7486)

IAGWSP, 2005. *Draft Former A Range Interim Groundwater Monitoring Plan Project Note*. Impact Area Groundwater Study Program, Massachusetts Military Reservation, Cape Cod, Massachusetts. December 20, 2005. (EDMS Document ID 8379)

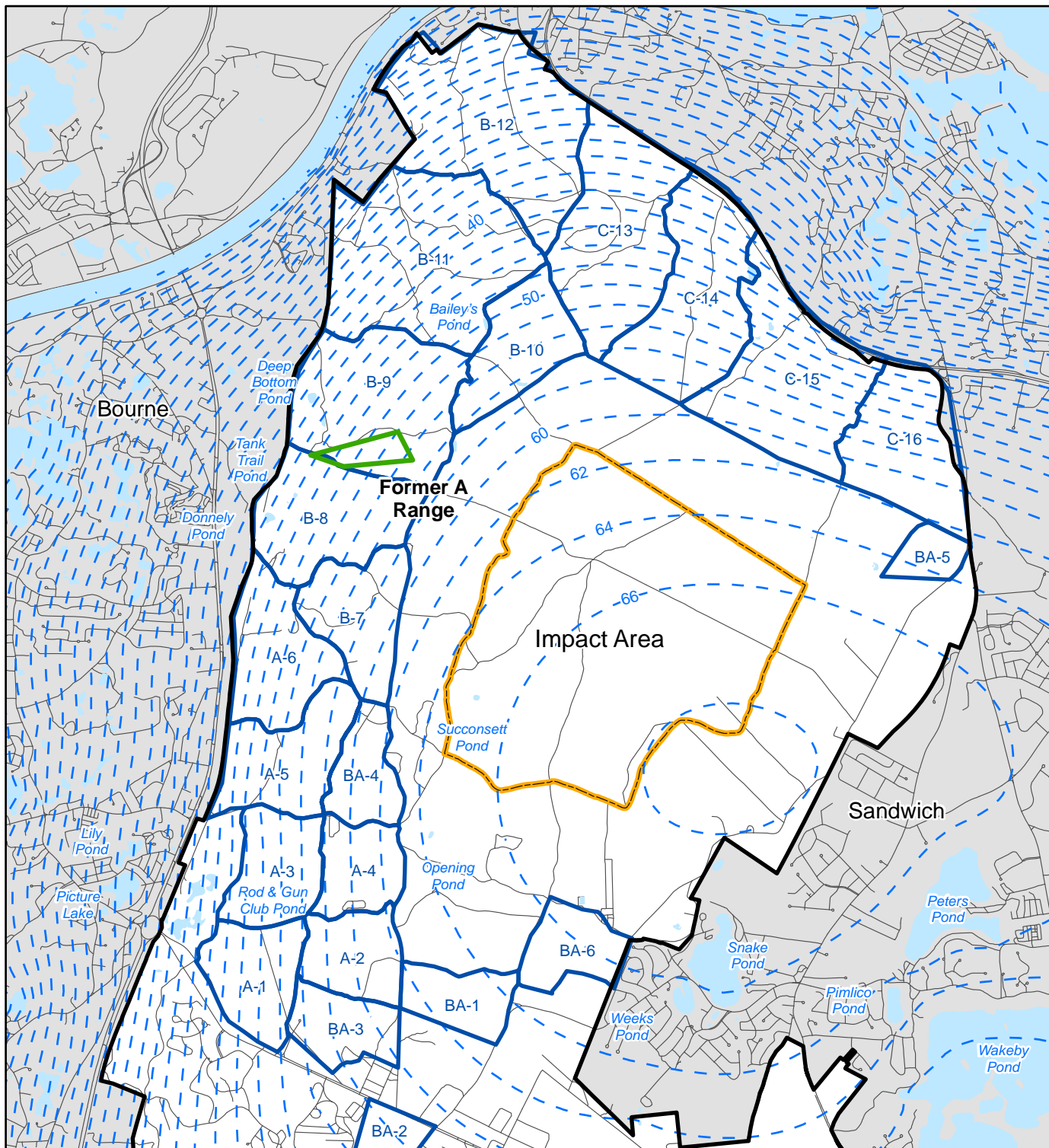
IAGWSP, 2012. *Final Former A Range Investigation Report*. Impact Area Groundwater Study Program, Massachusetts Military Reservation, Cape Cod, Massachusetts. April 2012. (EDMS Document ID 113772)

Tetra Tech EC, Inc., 2012. *Final IAGWSP Generic Quality Assurance Project Plan*. Impact Area Groundwater Study Program, Massachusetts Military Reservation, Cape Cod, Massachusetts. Prepared by Tetra Tech EC, Inc., February, 2012. (EDMS Document ID 113291)

USACE, 2012. *Final Former A Range Interim Environmental Monitoring Report August 2010 through May 2011*. Impact Area Groundwater Study Program, Massachusetts Military Reservation, Cape Cod, Massachusetts. Prepared by U.S. Army Corps of Engineers, New England District, Concord, Massachusetts. January 2012 (EDMS Document ID 113007)

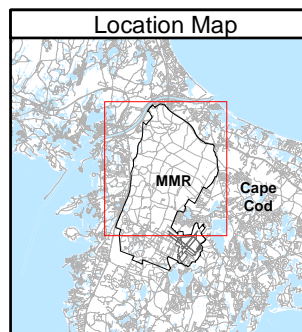
USEPA, 2012. *Final Decision Document, Former A Range, Former K Range, and Gun and Mortar Positions*. US Environmental Protection Agency, Region 1. September 2012 (EDMS Document ID 114801)

FIGURES



Legend

- MMR Boundary
- Impact Area Boundary
- Training Areas
- Former A Range Site Boundary
- Groundwater Elevation Contours**
(in feet above NGVD)
- Water Level Contours - MMR10



0 2,500 5,000
Feet



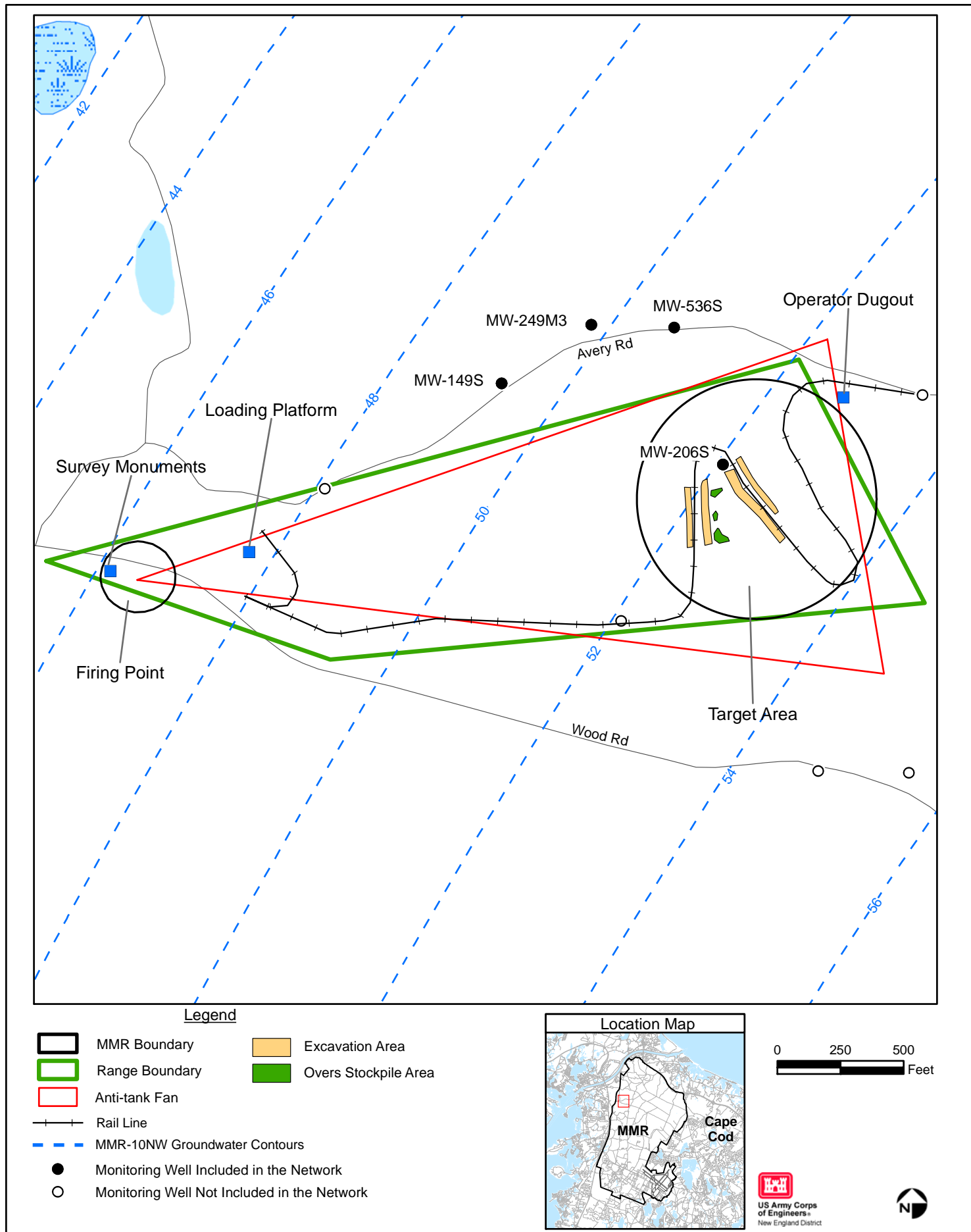
DRAFT

Location of Former A Range

FIGURE

1-1



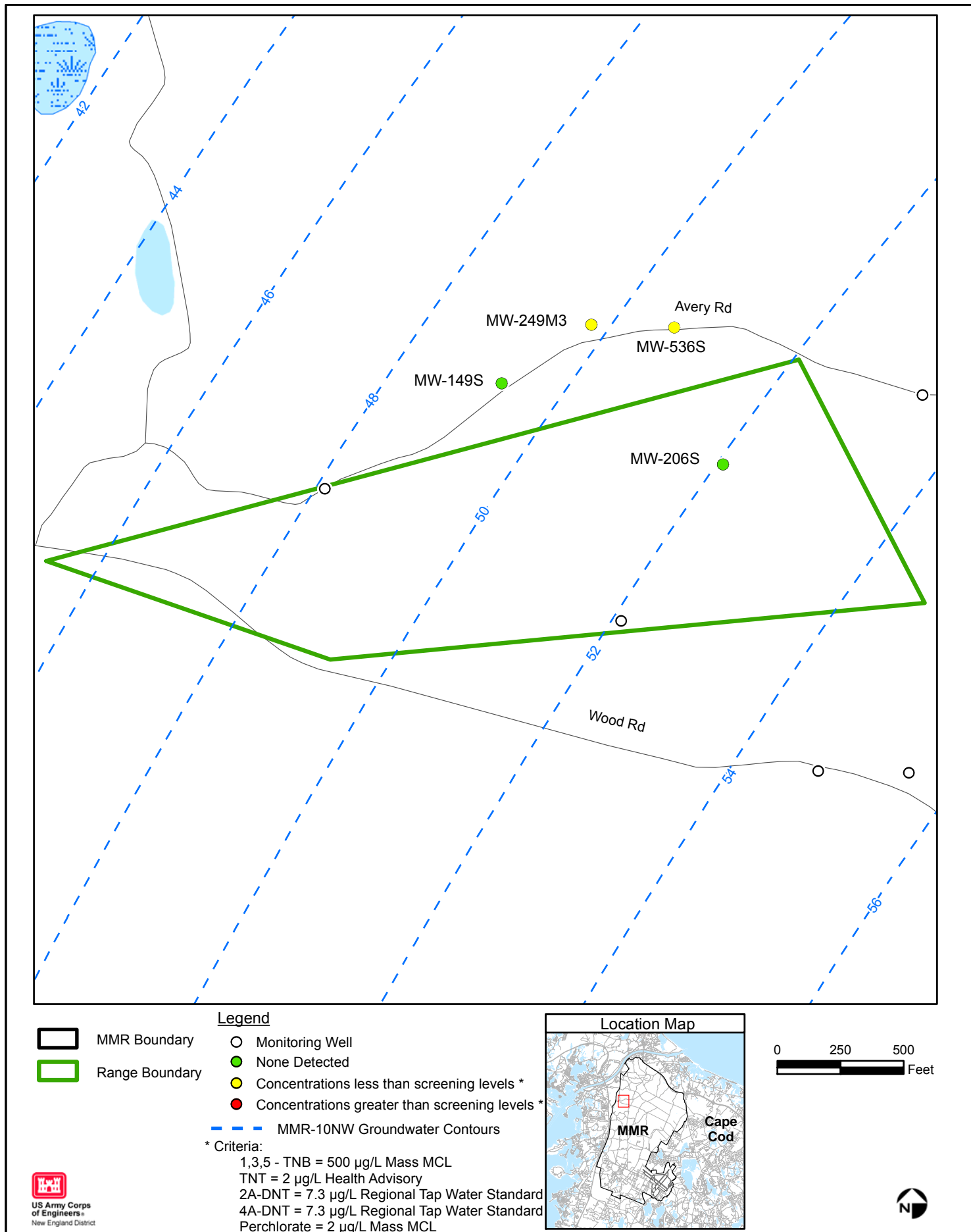


Former A Range Groundwater Monitoring Well Network

FIGURE

1-2





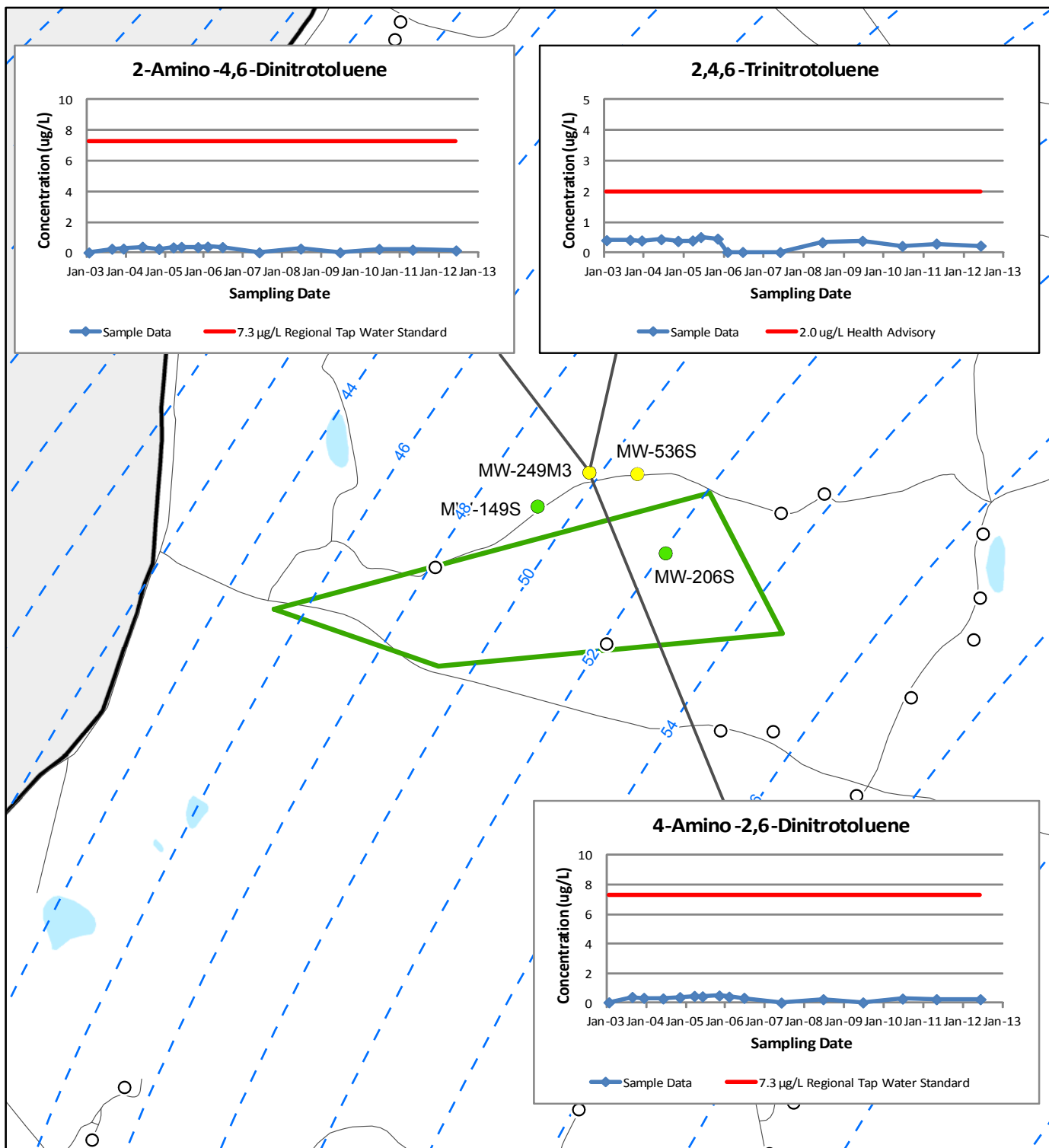
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Former A Range Explosives and Perchlorate Detections 2012 Reporting Period

FIGURE

3-1



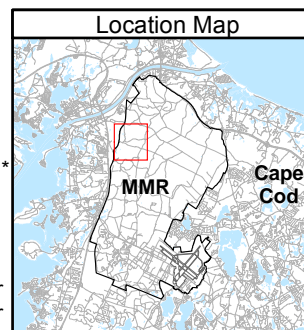


Legend

- MMR Boundary
- Range Boundary
- Monitoring Well
- None Detected
- Concentrations less than screening levels *
- Concentrations greater than screening levels *
- MMR-10NW Groundwater Contours

* Criteria:

TNT = 2 µg/L Health Advisory
 2A-DNT = 7.3 µg/L Regional screening level for tap water
 4A-DNT = 7.3 µg/L Regional screening level for tap water



0 500 1,000
 Feet



DRAFT

Explosives Concentration Trends - Monitoring Well MW-249M3

FIGURE

3-2



TABLES

Table 2-1
Former A Range - Groundwater Monitoring Well Network
2012 Reporting Period

Well ID	Northing (utm - meters)	Easting (utm - meters)	Ground Elevation (ft msl)	Screen Top Elevation (ft msl)	Screen Bottom Elevation (ft msl)	Groundwater Elevation on 6/12 & 6/20, 2012 (ft msl)	Sample Collection Frequency	Historically Tested Parameters*
MW-149S	4621207.28	369773.66	155.12	49.12	39.12	53.26	Annual	Explosives
MW-206S	4621109.38	370040.56	207.78	51.78	41.78	55.40	Annual	Explosives
MW-249M3	4621278.00	369881.78	186.92	32.92	22.92	53.25	Annual	Explosives & Perchlorate
MW-536S	4621274.76	369981.63	208.02	50.02	40.02	54.00	Annual	Explosives & Perchlorate

Notes:

utm - universal transverse mercator ft msl - feet above mean sea level

Table 3-1
Former A Range Groundwater Monitoring Results
2012 Reporting Period

Well ID	Sampling Date	Sample Type	Lab Method	Analyte Group	Analyte	Result (ug/L)	Lab Qualifier	MDL	RL
MW-149S	12-Jun-12	N	SW8330	Explosives	ND for 19 Analytes	ND	U	ND	ND
MW-206S	20-Jun-12	N	SW8330	Explosives	ND for 19 Analytes	ND	U	ND	ND
MW-249M3	20-Jun-12	N	SW6850	Perchlorate	Perchlorate	0.032	J	0.015	0.20
MW-249M3	20-Jun-12	N	SW8330	Explosives	1,3,5-Trinitrobenzene	0.13	J	0.0098	0.20
		N	SW8330		2,4,6-Trinitrotoluene	0.23		0.032	0.20
		N	SW8330		2-Amino-4,6-Dinitrotoluene	0.15	J	0.026	0.20
		N	SW8330		4-Amino-2,6-Dinitrotoluene	0.15	J	0.020	0.20
		N	SW8330		ND for 15 Analytes	ND	U	ND	ND
MW-536S	20-Jun-12	N	SW6850	Perchlorate	Perchlorate	0.13	J	0.015	0.20
MW-536S	20-Jun-12	N	SW8330	Explosives	ND for 19 Analytes	ND	U	ND	ND

Notes:

ug/L = micrograms per liter	N = primary field sample
MDL = method detection limit	FD = field duplicate
RL = reporting limit	ND = not detected above the RL
Denotes analyte Exceedances	J = estimated concentration

Analytical data validated according to the project Quality Assurance Project Plan (QAPP, Tetra Tech 2012). Associated data packages and data validation reports accessible on the Massachusetts Military Reservation Electronic Data Management System (EDMS).

Perchlorate by EPA Method 6850

Explosives by EPA Method 8330

APPENDIX A

PROJECT NOTE

Client, Project and Location:
Impact Area Groundwater Study Program
Former A Range Chemical Monitoring Network
Camp Edwards, MA

Subject: Former A Range Optimized Chemical Monitoring Network

Date: October 25, 2012

PURPOSE

The purpose of this Project Note (PN) is to document agency concurrence with modifications to the Former A Range chemical monitoring well network. Modifications to the monitoring network were proposed in the Draft Former A Range Interim Environmental Monitoring Report, Sampling Year 2012, dated September 2012.

Chemical Monitoring Optimization

As stated in the Draft Former A Range Interim Environmental Monitoring Report, in consideration of consistent results obtained in the network wells sampled in 2012 and previous years, the sampling frequency will be decreased from annual to biennial (every two years for calendar years 2014 and 2016). Groundwater monitoring will be conducted at monitoring wells MW-149S and MW-206S for explosives and MW-249M3 and MW-536S for explosives and perchlorate. The data will be assessed as part of a five-year review to be conducted in 2017 and the need for additional monitoring will be determined at that time. This change is consistent with the Decision Document. See Table 1 for a summary of the proposed changes.

CONCURRENCE

Concurrence with the recommendations presented in this project note are represented by the signatures below:

Robert L. [Signature] 11/6/12 Henry Gu 11/6/12

USEPA Representative

MassDEP Representative

Benjamin P. [Signature] 11/7/12

IAGWSP Representative

Attachment:

Table 1 Former A Range - Approved Groundwater Monitoring Well Network

TABLE

Table 1
Former A Range - Approved Groundwater Monitoring Well Network

Well ID	Screen Top Elevation (ft msl)	Screen Bottom Elevation (ft msl)	Sample Collection Frequency - Sampling Year 2012	Tested Parameters - Sampling Year 2012	Approved Sample Collection Frequency *	Tested Parameters
MW-149S	49.12	39.12	Annual	Explosives	Biennial	Explosives
MW-206S	51.78	41.78	Annual	Explosives	Biennial	Explosives
MW-249M3	32.92	22.92	Annual	Explosives & Perchlorate	Biennial	Explosives & Perchlorate
MW-536S	50.02	40.02	Annual	Explosives & Perchlorate	Biennial	Explosives & Perchlorate

Notes:

ft msl - feet above mean sea level
* Biennial sampling is calendar years 2014, 2016, 2018, etc.